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(54) Cushioning conversion machine/method and packaging system

(57) A cushioning conversion machine/method characterized by a stock roll support assembly and/or a stock supply assembly which accommodates a variety of orientations of the machine. The stock roll support assembly may be positioned in a plurality of orientations and includes a stock roll support bracket having a slot forming a stock roll rod cradle which is compatible with the plurality of orientations. The stock supply assembly includes a constant entry bar may be mounted in a plurality of positions.

A cushioning conversion packaging system characterized by mounting components which provide a high degree of fine-tuning ability and/or 90° pivot brake points. Additionally or alternatively, the packaging system is characterized by certain mounting components being located with the interior cavity defined by the machine's housing whereby these components could, for the sake of manufacturing ease and consistency, be included all on cushioning conversion machines, regardless of whether they will be incorporated into a packaging system.

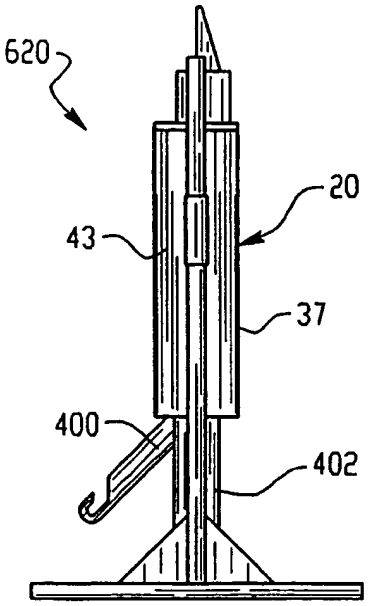

Fig. 8A

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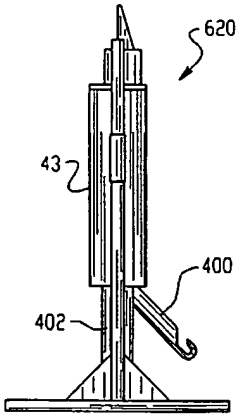

Fig. 8B

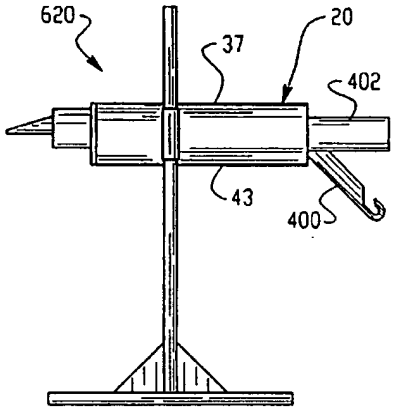

Fig. 8C

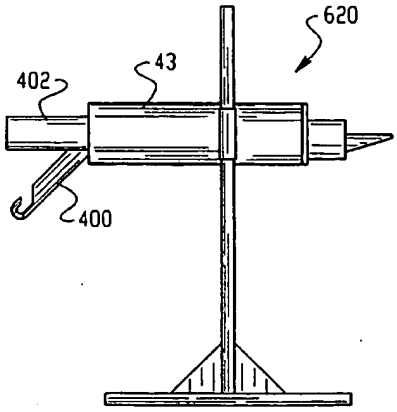

Fig. 8D

Description

The present invention relates to a cushioning conversion machine and method including a stock roll support assembly and/or a stock supply assembly which accommodates a variety of orientations of the machine.

The present invention also relates to a packaging system in which the coupling components provides a high degree of fine-tuning ability and 90° pivot brake points. Additionally or alternatively, certain coupling components are located on the interior of the machine whereby they could, for the sake of manufacturing ease and consistency, be included all on cushioning conversion machines, regardless of whether they will be incorporated into a packaging system.

In the process of shipping an item from one location to another, a protective packaging material is typically placed in the shipping case, or box, to fill any voids and/or to cushion the item during the shipping process. Some conventional commonly used protective packaging materials are plastic foam peanuts and plastic bubble pack. While these conventional plastic materials seem to adequately perform as cushioning products, they are not without disadvantages. Perhaps the most serious drawback of plastic bubble wrap and/or plastic foam peanuts is their effect on our environment. Quite simply, these plastic packaging materials are not biodegradable and thus they cannot avoid further multiplying our planet's already critical waste disposal problems. The non-biodegradability of these packaging materials has become increasingly important in light of many industries adopting more progressive policies in terms of environmental responsibility.

These and other disadvantages of conventional plastic packaging materials have made paper protective packaging material a very popular alternative. Paper is biodegradable, recyclable and renewable; making it an environmentally responsible choice for conscientious industries. While paper in sheet form could possibly be used as a protective packaging material, it is usually preferable to convert the sheets of paper into a relatively low density pad-like cushioning dunnage product. This conversion may be accomplished by a cushioning conversion machine, such as that disclosed in U.S. Patent No. 5,322,477. This patent is assigned to the assignee of the present application and its entire disclosure is hereby incorporated herein by reference.

A cushioning conversion machine commonly comprises a frame, conversion assemblies and a stock supply assembly. The conversion assemblies are usually mounted to the machine's frame and convert the stock material into a three-dimensional cushioning product. The stock supply assembly is positioned upstream of the conversion assembly and supplies the stock material to the conversion assemblies. The stock supply assembly may be mounted to the machine's frame and include a stock roll support which supports a stock roll for dispensing the stock material to the conversion assemblies. The stock supply assembly also typically includes a "constant entry roller" over which the stock material passes to determine the entry path of the stock material to the conversion assemblies. While the prior stock supply assemblies have worked well when a cushioning conversion machine is in a horizontal orientation (*i.e.*, an orientation whereat an imaginary line drawn from its upstream end to its downstream end is substantially horizontal), they do not work well when the cushioning conversion machine is in certain other orientations.

A cushioning conversion machine may be incorporated into a packaging system that can be used to convert the machine between a horizontal and vertical orientation. The packaging system typically includes (in addition to the machine) a machine mounting stand for mounting the cushioning conversion machine in a desired orientation, a stock supply cart for supporting the stock roll, and mounting components for mounting the machine to the mounting stand. The prior mounting components were attached to the exterior of the machine and extended outwardly therefrom. Accordingly, unless a cushioning conversion machine is being mounted on a stand, these mounting components are generally not desirable to have on "stand-less" cushioning conversion machine (i.e., a machine which will rest on a surface or will be otherwise supported). From a manufacturing point of view, this makes it necessary to manufacture "stand" machines differently than "stand-less" machines. Also, the prior mounting components often allowed only a set amount of positions within a 180° interval whereby the "fine-tuning" of the angular position of the cushioning conversion machine relative to a packaging site and/or a particular operator was somewhat limited. Additionally or alternatively, settings outside of the 180° range (i.e. within a 360° range) were not possible.

The present invention provides a cushioning conversion machine comprising a stock roll support assembly which may be positioned in a plurality of orientations relative to the machine's frame and/or its conversion assemblies. The stock roll support assembly preferably may be positioned at three or more positions relative to the machine's frame and more preferably may be positioned at four positions relative to the machine's frame. Even more preferably, the stock roll support assembly may be positioned at a position whereat the stock roll support assembly extends outwardly from the machine's base wall and a stock roll cradle opens towards the downstream direction; a position whereat the stock roll support assembly extends outwardly from the machine's cover and a stock roll cradle opens towards the downstream direction; a position whereat the stock roll support assembly extends outwardly from the machine's base wall and a stock roll cradle opens towards the upstream direction; and/or a position whereat the stock roll support assembly extends outwardly from the machine's cover and a stock roll cradle opens towards the upstream direction.

The present invention also provides a cushioning conversion machine including at least one stock roll support bracket (and preferably two) having a rod-cradle which allows the plural positioning of the bracket. In the preferred embodiment, the rod-cradle is part of a slot defined by a U-shape edge having a curved bottom and two sides extending therefrom which are positioned parallel to the longitudinal direction of the bracket. Preferably the slot also includes a sloped inlet passage into the U-shape cradle and/or the bracket extends at an approximately 45° angle relative to the upstream-downstream direction of the machine.

The present invention also provides a stock supply assembly on which a constant entry bar may be mounted in a plurality of positions. The preferred stock supply assembly includes a pair of brackets between which the roller is mounted and/or a sheet separator positioned downstream of the roller.

The present invention also provides a packaging system wherein mounting components allows a cushioning conversion machine to be pivoted substantially 360° relative to a machine mounting stand about a substantially horizontal axis and/or wherein at least some of the mounting components are situated within the interior of the housing of the cushioning conversion machine.

In the preferred packaging system, the mounting components include a pivot pin which extends through an opening in the machine's housing into the interior cavity and the pivot pin constitutes an axis about which the machine may be selective pivoted relative to the machine mounting stand. The pivot pin extends through an opening in a side wall of the machine's housing and the side wall includes an outer casing and an inner reinforcement plate. Preferably, the mounting components also include locking elements to lock the machine in a certain pivotal position relative to the machine mounting stand and the locking elements also perform a braking function when the machine is being pivoted relative to the machine mounting stand.

There now follows a description of preferred embodiments of the invention, by way of non-limiting example, with reference being made to the accompanying drawings, in which:

Figure 1 is a side view of the cushioning conversion machine disclosed in U.S. Patent No. 5,322,477, the machine being shown positioned in a horizontal manner, loaded with stock material, and with an outer housing side wall removed for clarity of illustration.

Figure 2 is an opposite side view of the cushioning conversion machine of Figure 1.

Figure 3 is a top plan view of the cushioning conversion machine of Figure 1, without stock material being loaded and as seen along line 3-3 in Figure 1.

Figure 4 is a side view of a packaging system, including the cushioning conversion machine of Figures 1-3, a machine mounting stand, and coupling components which mount the machine to the stand.

Figure 5 is an enlarged view of the coupling components and relevant portions of the machine and stand, the orientation of the coupling components corresponding to a vertical positioning of the machine.

Figure 6 is an enlarged view of the coupling components and relevant portions of the machine and stand, the orientation of the coupling components corresponding to a horizontal positioning of the machine.

Figure 7 is a sectional view taken along line 7-7 in Figure 5.

Figures 8A-8D are schematic views of a packaging system which includes a cushioning conversion machine incorporating a stock roll support assembly and a stock supply assembly according to the present invention, the machine and stock roll support assembly being shown in various orientations.

Figures 9A-9D are schematic views of the stock roll support assembly and the stock supply assembly isolated from the other components of the cushioning conversion machine, the stock roll support assembly being shown in various orientations.

Figure 10 is a plan view of a bracket of the stock roll support assembly.

Figure 11 is a plan view of a bracket of the stock supply assembly.

Figures 12A and 12B are schematic views showing two alternate mountings of a constant entry bar on the stock supply assembly.

Figure 13 is a front view of coupling components according to the present invention which may be used in a packaging system to mount a cushioning conversion machine to a machine mounting stand.

Figure 14 is a sectional view of the coupling components and relevant portions of the cushioning conversion machine.

Figure 15 is an inside view of a side wall of the cushioning conversion machine.

Figures 16A-16P are schematic illustrations of the 360° range of orientations possible in a packaging system with the coupling components of the present invention.

Referring now to the drawings in detail, the cushioning conversion machine disclosed in U.S. Patent No. 5,322,477 is shown in Figures 1-3 and is indicated generally at 20. In Figures 1 and 2, the machine 20 is shown positioned in a horizontal manner and loaded with a roll 21 of sheet stock material 22. The stock material 22 may consist of three superimposed webs or layers 24, 26, and 28 of biodegradable, recyclable and reusable thirty-pound Kraft paper rolled onto a hollow cylindrical tube 29. A thirty-inch roll of this paper, which is approximately 450 feet long, will weigh about 35 pounds and will provide cushioning equal to approximately four 15 ft^3 bags of plastic foam peanuts while at the same time requiring less than one-thirtieth the storage space.

The machine 20 converts this stock material 22 into a continuous unconnected strip having lateral pillow portions separated by a thin central band. This strip is con-

nected along the central band to form a connected strip which is cut into sections 32 of a desired length. The cut sections 32 each include lateral pillow portions 33 separated by a thin central band and provide an excellent relatively low density pad-like product which may be used instead of conventional plastic protective packaging material.

The machine 20 includes a housing, indicated generally at 36, having an upstream or "feed" end 38 and a downstream or "discharge" end 40. The terms "upstream" and "downstream" in this context are characteristic of the direction of flow of the stock material 22 through the machine 20. The housing 36 is positioned in a substantially horizontal manner whereby an imaginary longitudinal line or axis 42 from the upstream end 38 to the downstream end 40 would be substantially horizontal.

The housing 36 includes side walls 37, a top or cover wall 39, a base plate or wall 43 and two end walls 44 and 46. The base wall 43 is generally rectangular and extends from the upstream end 38 to the downstream end 40 of the frame 36 in a generally horizontal plane. Although not perfectly apparent from the illustrations, the first or upstream wall 44 may be more specifically described as a thin rectangular wall having a rectangular stock inlet opening 47 passing therethrough. For example, the side and base walls 37 and 43 may have upstream inwardly turned end sections that form a rectangular border around the stock inlet opening 47 and thus the upstream wall 44. The second or downstream end wall 46 is generally rectangular and planar and includes a relatively small rectangular outlet opening.

The upstream end wall 44 extends generally perpendicular in one direction from the upstream end of the frame base wall 43. In the illustrated orientation of Figures 1 and 2, this direction is upward. The downstream end wall 46 is preferably aluminium and extends in generally the same perpendicular direction from the downstream end of the frame base wall 43. The housing 36 also includes a box-like extension 49.

The machine 20 further includes a stock supply assembly 50, a forming assembly 52, a feed assembly 54 powered by a feed motor 55, a cutting assembly 56 powered by a cutter motor 57, and a post cutting assembly 58. In operation of the machine 20, the stock supply assembly 50 supplies the stock material 22 to the forming assembly 52. The forming assembly 52 causes inward rolling of the lateral edges of the sheet stock material 22 to form the lateral pillow portions 33 of the continuous strip. The feed assembly 54 pulls the stock material 22 from the stock roll 21, through the stock supply assembly 50, and through the forming assembly 52 and also connects or stitches the central band of the strip to form the connected strip. As the connected strip travels downstream from the feed assembly 54, the cutting assembly 56 cuts the strip into sections 32 of a desired length. These cut sections 32 then travel through the post-cutting assembly 58.

Turning now to the details of the various assemblies, the stock supply assembly 50 includes two laterally spaced brackets 62 stiffened or reinforced by angle brackets (not shown). The brackets 62 are each generally shaped like a sideways "U" and have two legs 64 and 65 extending perpendicularly outward from a flat connecting base wall 66. (See Figures 1 and 2.) For each bracket 62, the base wall 66 is suitably secured to the downstream side of the frame end wall 44. Thus, the bracket legs 64 and 65 extend in a direction parallel to upstream-downstream direction of the machine 20.

The bracket legs 64 each have open slots 70 in their distal end to cradle, or support, a supply rod 72. (Thus the bracket legs 64 are the stock roll supporting assembly of the cushioning conversion machine 20.) The slot 70 is generally U-shape having a semi-circular bottom and two relatively straight sides which are positioned perpendicular to the longitudinal direction of bracket leg 64. The supply rod 72 is designed to extend relatively loosely through the hollow tube 29 of the stock roll 21. As the stock material 22 is pulled through the machine 20 by the feed assembly 54, the tube 29 will freely rotate thereby dispensing the stock material 22. A pin (not shown) may be provided through one or both ends of the supply rod 72 to limit or prevent rotation of the supply rod 72 itself.

The other legs 65 of the U-brackets 62 extend from an intermediate portion of the frame end wall 44 and cooperate to mount a sheet separator 74. The sheet separator 74 includes three horizontally spaced relatively thin cylindrical separating bars 76, 77 and 78. The number of separating bars, namely three, corresponds to the number of paper layers or webs of the stock material 22. The sheet separator 74 separates the layers 24, 26 and 28 of paper prior to their passing to the forming assembly 52. This "pre-separation" improves the resiliency of the produced dunnage product. Details of a separating mechanism similar to the separator 74 are set forth in U.S. Patent No. 4,750,896. (This patent is assigned to assignee of the present application and its entire disclosure is hereby incorporated by reference.)

The bracket legs 65 also cooperate to support a constant-entry bar 80 which is rotatably mounted on the distal ends of the legs. The bar 80 provides an unvarying point of entry for the stock material 22 into the separator 74 and forming assembly 52, regardless of the diameter of the stock roll 21. Thus, when a different diameter roll is used and/or as dispensation of the stock material 22 from roll 21 decreases its diameter, the point of entry of the stock material 22 into the separator 74 remains constant. This consistency is believed to facilitate the uniform production of cushioning dunnage. Details of a "roller member" or a "bar member" similar to the constant-entry bar 80 are set forth in U.S. Patent No. 4,750,896.

After the stock material 22 is pulled from the stock roll 21 over the constant-entry bar 80 and through the sheet separator 74, it is pulled through the stock inlet

opening 47 to the forming assembly 52. The forming assembly 52 includes a three-dimensional bar-like shaping member 90 (or forming frame), a converging chute 92, a transverse guide structure 93 and a guide tray 94. The stock material 22 travels between the shaping member 90 and the frame base wall 43 until it reaches the guide tray 94. At this point, the transverse guide structure 93 and the guide tray 94 guide the stock material 22 longitudinally and transversely into the converging chute 92. During this downstream travel, the shaping member 90 rolls the edges of the stock material 22 to form the lateral pillow portions and the converging chute 92 coact with the shaping member 90 to form the continuous strip. As the strip emerges from the converging chute 92, the guide tray 94 guides the strip into the feed assembly 54.

The shaping member 90 is a three-dimensional forming frame having a V-like, (in plan) body and generally U-shaped (in end elevation) ribs extending downwardly from and generally transverse to the body portion. Further structural details of the shaping member 90 or "forming frame" are set forth in U.S. Patent No. 4,750,896.

The guide tray 94 is directly mounted on the frame base wall 43; while the transverse guide structure 93 and the converging chute 92 are mounted on the guide tray 94. The guide tray 94 is trapezoidal in shape, as viewed in plan, having a broad upstream side 105 and a parallel narrow downstream side 106. The broad side 105 is positioned downstream of at least a portion of the shaping member 90. The narrow side 106 is positioned adjacent the outlet opening in the frame end wall 46 and includes a rectangular slot 107 to accommodate the feed assembly 54. The guide tray 94 is not positioned parallel with the frame base wall 43, but rather slopes away (upwardly in Figures 1 and 2) from the frame base wall 43 to the feed assembly 54.

The converging chute 92 is mounted on the guide tray 94 upstream of at least a portion of the shaping member 90 and downstream slightly from the broad side 105 of the guide tray 94. The transverse guide structure 93 is mounted on the guide tray 94 just upstream of the entrance mouth of the converging chute 92. The transverse guide structure 93 includes rollers 108 rotatably mounted on a thin U-bracket 109. The distal ends of the U-bracket 109 are secured to the guide tray 94. Except for this mounting arrangement, the transverse guide structure 93 is similar to the "rollers and wire frame" disclosed in U.S. Patent No. 4,750,896.

With the guide tray 94 and the transverse guide structure 93 mounted in this manner, the stock material 22 travels over the guide tray 94, under the upstream end of the shaping member 90, between the rollers 108 of the transverse guide structure 93, and into the converging chute 92. The basic cross-sectional geometry and functioning of the converging chute 92 is similar to that of the converging member described in U.S. Patent No. 4,750,896.

Alternatively, the forming assembly 52 may include the chute and/or the shaping member disclosed in U.S. Patent Application No. 08/487,179. (This application is assigned to the assignee of the present application and its entire disclosure is hereby incorporated by reference.) Such a chute has an inlet end which is outwardly flared in a trumpet-like fashion to facilitate passage of the stock material into the shaping chute. (The trumpet-like inlet may eliminate the need for the transverse guide structure 93.) Such a shaping member is longitudinally formed into a U-shape comprised of a first leg attached to a top wall of the chute and a second leg extending into the chute generally parallel with the bottom wall of the chute.

The stock material 22 will emerge from the chute 92 as the continuous unconnected strip. The emerging strip is guided to the feed assembly 54 by the narrow downstream end 106 of the guide tray 94, which extends from the outlet opening of the chute to the outlet opening in the frame end wall 46. The feed assembly 54 includes rotating feed members between which the stock material 22 travels, specifically loosely meshed drive gear 124 and idler gear 126. When the gears 124 and 126 are turned the appropriate direction, which in Figure 1 would be counterclockwise for gear 124 and clockwise for gear 126, the central band of the strip is grabbed by the gear teeth and pulled downstream through the nip of gears 124 and 126. This same "grabbing" motion caused by the meshing teeth on the opposed gears 124 and 126 simultaneously compresses or "coins" the layers of the central band together thereby connecting the same and forming the connected strip.

The drive gear 124 is positioned between the frame base wall 43 and the guide tray 94 and projects through the rectangular slot 107 in the guide tray 94. The gear 124 is fixedly mounted to a shaft 130 which is rotatably mounted to the upstream side of the frame end wall 46 by bearing structures 131. A sprocket 132 at one end of the shaft accommodates a chain 133 which connects the shaft 130 to a speed reducer 136. As is best seen in Figure 1, the feed motor 55 and the speed reducer 136 are mounted on the frame base wall 43 at approximately the same level as the forming assembly 52.

The idler gear 126 is positioned on a side of the guide tray 94 opposite the drive gear 124 and is rotatably mounted on a shaft 140. Shaft brackets 142 attached to an upstream side of the frame end wall 46 non-rotatably support the ends of the shaft 140 in spring-loaded slots 144. In this manner, the idler gear 126 is free to "float" towards and away from the drive gear 124 thereby creating an automatic adjustment system for the feed assembly 54. Alternatively, the automatic adjustment system for feed assembly 54 could be of the type disclosed in U.S. Patent Application No. 08/487,179 wherein the pinch force applied by the rotating feed members 124 and 126 could be adjusted without changing a minimum set distance between the shafts 130 and 140.

Additionally or alternatively, the rotating feed mem-

bers 124 and 126 may be of the type used in the stitching assembly disclosed in U.S. Patent Application No. 08/607,607. (This application is assigned to the assignee of the present application and its entire disclosure is hereby incorporated by reference.) In such a stitching assembly, the first rotating feed member has a plurality of radially outwardly extending projections around its circumference and the projections have axially spaced apart segments defining a recess therebetween. The second rotating feed member has axial punch segments which each include a peripheral edge portion for receipt into the first member's recesses. The peripheral edge portions have opposite corners which are cooperative with the first member's projections to cut a row of slit tabs in the overlapped portions of the stock material to form slit tabs that function to interlock these overlapped portions of the stock material plies.

In any event, the feed assembly 54 transforms the unconnected strip into the connected strip and this strip travels through the outlet opening in the frame end wall 46. The connected strip is then cut by the cutting assembly 56 into cut sections 32 of the desired length. The cutting assembly 56 may be of any suitable type, such as the types disclosed in U.S. Patent No. 5,123,899, the type disclosed in U.S. Patent Application No. 08/110,349, and/or the type disclosed in U.S. Patent Application No. 08/188,305. (This patent and these applications are assigned to the assignee of the present invention and their entire disclosures are hereby incorporated by reference.) However, whatever type of cutting or severing assembly is used, the connected strip is divided into cut sections 32 of the desired length and these cut sections 32 then travel downstream to the post cutting assembly 58.

The post-cutting assembly 58 is basically funnel-shaped and includes an upstream converging portion 300 which tapers into a downstream rectangular tunnel portion 302. The converging portion 300 is located between the downstream frame end wall 46 and the housing extension 49, while the tunnel portion 302 extends through and beyond the extension 49. The post-cutting assembly 58 is positioned so that its inlet 304 is aligned with the outlet opening of the end wall 46. The downstream outlet 306 of the post-cutting assembly 58 is also preferably aligned with the outlet opening and also the inlet 304.

A cut section 32 will be urged or pushed downstream into the inlet 304 of the post-cutting assembly 58 by the approaching connected strip. The converging portion 300 smoothly urges the section 32 into the tunnel portion 302. A cut section 32 emerging from the post-cutting assembly 58 may be directed to a desired packing location, the conversion of stock material 22 to cut sections 32 of relatively low density pad-like cushioning dunnage product now being complete.

The machine 20 may be incorporated into a packaging system, such as the packaging system 620 shown in Figure 4. In addition to the machine 20, the packaging system 620 includes a machine mounting stand 622 for mounting the machine 20 in a desired orientation, a stock supply cart 626 for supporting the stock roll 21, and mounting components for mounting the machine 20 to the machine mounting stand 622.

The machine mounting stand 622 includes a floor support 630, and two vertical posts 632 extending upwardly therefrom. The floor support 630 is generally "H" shaped and includes two side members extending outwardly from both sides of an elevated lower cross bar. Leveling feet on the distal ends of the side members allow for adjustment or leveling of the machine mounting stand on the floor of a packaging site. The vertical posts 632 are rigidly secured to the side members by two triangular braces.

The components which mount the machine 20 on the machine mounting stand 622 are such that the machine is vertically adjustable relative to the machine stand. In this manner, the packaging system 620 may accommodate, for example, conveyor belts of various heights and/or different shaped shipping cases. In addition to vertical adjustment, the mounting components allow angular or "tilt" adjustment of the machine 20 relative to the machine mounting stand 622 whereby the machine 20 may be positioned in a variety of orientations, such as a vertical orientation, a horizontal orientation, and angular orientations therebetween.

The mounting components include sliders 660 which are mounted on the vertical posts 632 of the machine mounting stand 622. The sliders 660 are substantially identical. One of the sliders, and the components attaching it to the machine 20 and the machine mounting stand 622 are shown in detail in Figures 5-7. The slider 660 includes a sleeve 664 having four sides forming a square channel. The sleeve 664 is telescopically movable on a respective one of the vertical posts 632 for vertical adjustment of the machine 20. (See Figure 5.) The sleeve 664 (and the corresponding vertical post 632 of the machine mounting stand 62) are designed so that the slider 660 may be attached to the vertical post 632 at different vertical heights. For example, the posts 632 could include one or more openings and the sliders 660 could include one or more openings (usually a lesser number than the post) selectively alignable with the openings in the post 632. The sliders 660 would be vertically slid to the desired position on the posts 632 where the openings align and fastening elements (such as bolts, pins, etc.) would be inserted into the aligned openings to mount the sliders at the desired position. A pulley system may be provided to assure equal vertical adjustment of the two sliders 660.

The slider 660 includes a stop plate 670 which is attached to the sleeve 664 by a side angle bracket 665. More particularly, one perpendicular wall 666 of each angle bracket 665 is secured to one side of the sleeve 665 and the other perpendicular wall is attached to the stop plate 670 by fasteners 671. The fasteners 671 extend through four openings 672 in the bracket wall 667

and aligned openings 673 in the stop plate 670.

A swivel plate 675 is fixedly attached to the machine 20 at a bottom edge thereof by an angle bracket 676 and fasteners 677. Also, the swivel plate 675 is rotatably attached to the stop plate 675 by a pivot pin 681. Thus, the pivot pin 681 provides an axis about which the machine 20 may be selectively pivoted relative to the machine mounting stand 622. This axis is positioned such that the machine 20 is substantially weight balanced. In other words, the position of the pivot pin 681 substantially coincides with the center of mass of the machine 20 thereby making the machine 20 rotationally neutral.

A spring plunger 679 is mounted in an opening 680 in the stop plate 670 to set the desired angular positioning of the swivel plate 675 relative to the stop plate 670. To this end, the swivel plate 675 has a semi-circular array of openings 678 into which the spring plunger 679 may be inserted. To pivot the machine 20 to the desired position, the spring plunger 679 is retracted from the swivel plate 675 to allow the swivel plate 675 (and thus the machine 20) to pivot relative to the stop plate 670 (and thus the machine mounting stand 622). Once the machine 20 has been pivoted to the desired position, the spring plunger 679 is re-inserted into the appropriate opening 678 to set the swivel plate 675 (and thus the machine 20) in the desired angular position relative to the stop plate 670 (and thus the machine mounting stand 622).

If the spring plunger 679 is inserted through the central opening 678 in the semi-circular array, the machine 20 is positioned in a vertical orientation. (See Figure 6.) If the spring plunger 679 is inserted through one of the outermost openings 678 in the swivel plate 675, the machine is positioned in a horizontal orientation. If the spring plunger 679 is inserted through one of the non-central non-outermost openings 678, the machine 20 is positioned in a sloped orientation. (See Figure 7.) Thus, the machine 20 can be in a positioned at set intervals in a 180° range, including horizontal and vertical orientations. (See Figure 4.)

Referring again to the stock supply assembly 50, as was indicated above, the bracket legs 64 are the stock roll supporting assembly of the cushioning conversion machine. The legs 64 extend in a direction parallel to the upstream-downstream direction of the machine 20 and the straight sides of the rod-cradling slot 70 are perpendicular to the longitudinal direction of bracket leg 64. While this stock roll support arrangement works well while the machine 20 is in the horizontal orientation shown in Figures 1 and 2, it will not work when the machine is in certain other orientations. For example, if the machine 20 is positioned in the vertical orientation, the supply rod 72 (and thus the stock roll 21) would slip out of the slot 70. (See Figure 4.) One solution is to provide a separate stock dispensing assembly for supporting the stock roll 21. For example, in the packaging system 620, the stock supply assembly 50 continues to perform its separating and constant-entry functions (via the sheet separator 74 and the constant entry bar 80) and the stock roll 21 is supported on a separate stock supply cart 626. (See Figure 4.)

Another issue encountered when supporting the stock roll in different orientations relates to the constant entry roller 80. As was explained above, this bar 80 providesanunvarying, or consistent, point of entry for the stock material 22 into the separator 74 and forming assembly 52 and this consistency is believed to facilitate the uniform production of cushioning dunnage. However, this consistency is only maintained if the stock material 22 approaches the stock supply assembly 50 in relatively the same directional path. For example, in Figure 6, while the constant entry bar 80 will provide the same entry point if the stock supply cart 626 is located adjacent the base wall 43 of the machine 20 (or in other words, to the left or underneath), it will not do so if the cart 626 was moved to be adjacent to the cover 37 of the machine (or in other words, to the right).

The present invention provides a stock roll support assembly 400 and/or a stock supply assembly 402 which may be used to replace the stock supply assembly 50 of the above-described cushioning conversion machine 20 and/or any cushioning conversion machine or method which falls within the scope of the claims. As is explained in more detail below, the stock roll support assembly 400 and/or the stock supply assembly 402 are designed to accommodate a variety of orientations of a cushioning conversion machine.

The stock roll support assembly 400 and the stock supply assembly 402 are schematically shown on the cushioning conversion machine 20 which is incorporated into the packaging system 620 in Figures 8A-8D. As illustrated, the stock roll support assembly 400 is designed to be mounted to the machine's frame 36 in a plurality of orientations. The stock roll support assembly 400 may be mounted so that it extends outwardly from the machine's base wall 43 and so that its stock roll cradle opens towards the downstream direction. (See Figure 8A.) The stock roll support assembly 400 may be mounted so that it extends outwardly from the machine's cover 37 and so that its stock roll cradle opens towards the downstream direction. (See Figure 8B.) The stock roll support assembly 400 may be mounted so that it extends outwardly from the machine's base wall 43 and so that its stock roll cradle opens towards the upstream direction. (See Figure 8C.) The stock roll support assembly 400 may be mounted so that it extends outwardly from the machine's cover 37 and so that its stock roll cradle opens towards the upstream direction. (See Figure 8D.) In the preferred embodiment, the stock supply assembly 402 is mounted to the machine's frame 36 in a set position and the stock roll support assembly 400 is interchangeably mounted to the stock supply assembly 402. (See Figures 9A-9D.)

The stock roll support assembly 400 comprises two substantially identical brackets 403, one of which is illustrated in detail in Figure 10. As shown, the bracket

403 has a generally rectangular shape and is preferably approximately 5mm thick to eliminate the need for reinforcing or stiffening brackets. The downstream end or proximal end 404 (the upper end in the illustrated orientation) of the bracket 403 includes two rounded corners, but is generally rectangular. The upstream end or distal end 406 (the lower end in the illustrated embodiment) of the bracket 403 has a more rounded shape formed by a semi-circler edge portion connecting the two side edges of the rectangular shape.

The bracket's downstream end 404 includes four coupling components 408 which are used to mount the bracket 403 (and thus the stock roll support assembly 400) to the machine's frame 36. In the illustrated embodiment, the coupling components 408 are openings which coordinate with other coupling components, such as screws, rivets or other fastening elements. As was explained above, the stock roll support assembly 400 is preferably interchangeably mounted to the stock supply assembly 402 which in turn is mounted to the machine's frame 36 in a fixed position.

In any event, the coupling components 408 are arranged in a symmetrical position whereby the stock roll support assembly 400 may be arranged in at least two, and preferably three or four, positions relative to the machine's frame 36. In the illustrated embodiment, the openings 408 are arranged at the four corners of a square having sides parallel with the bracket's edges. However, other symmetrical arrangements, such as circular, triangular, and other polygonal arrangements, are possible with, and contemplated by, the present invention.

The bracket's rounded upstream end 406 includes edge portions which define an open slot 410. The shape of the slot 410 resembles a "crooked finger" and is defined by parallel sloped edge portions 412 and 414 forming the opening or inlet 415 of the slot 410, a U-shape edge portion 416 forming a cradle 417 for the supply rod 72, and vertical edge portions 418 and 420 forming a transition between the slot's inlet 415 and the cradle 417. The U-shape edge portion 416 has a semi-circular bottom and two relatively straight sides which are positioned parallel to the longitudinal direction of the bracket 403. The distance between the parallel sloped edge portions 412 and 414 is preferably greater than the distance between the vertical edge portions 418 and 420 (and/or the width of the U-shape edge portion 416) to facilitate loading of the stock roll into the stock roll support assembly 400.

Also, the geometry of the rod-cradle formed by the U-shape edge portion 416, and particularly the positioning of its two straight sides parallel with (rather than perpendicular to) the longitudinal direction of the bracket 403, allows the stock roll support assembly 400 to be mounted both in positions whereat the slot 410 opens towards the downstream direction (Figure 8A and 8B and Figures 9A and 9B) and positions whereat the slot 410 opens towards the upstream direction (Figure 8C and 8D and Figures 9C and 9D). Additionally, the machine 20 may be tilted from one position to another (e. g. from a vertical position to a horizontal position) without having to remove the stock roll 21. This allows, for instance, loading of the stock roll 21 at waist height and subsequent tilting of the machine 20 to a vertical orientation for operation, thereby making the stock roll loading operation easier.

The stock supply assembly 402 comprises two identical brackets 428, one of which is illustrated in detail in Figure 11. As shown, the bracket 428 also has a generally rectangular shape. The bracket's downstream end or proximal end 430 (the upper end in the illustrated embodiment) includes two substantially perpendicular corners. The bracket's upstream end or distal end 432 (the lower end in the illustrated embodiment) includes rounded corners, but is still generally rectangular.

The downstream end 430 of the bracket 428 includes openings 434 for mounting the bracket (and thus the stock supply assembly 402) to the machine's frame 36. The bracket's downstream end 430 also includes four coupling components 436 which coordinate with the coupling components 408 of the stock roll support assembly 400. In the illustrated embodiment, the coupling components 436 are openings which coordinate with other coupling components, such as screws, rivets or other fastening elements. Specifically, the fastening elements would extend through the openings 408 and 436 to mount the stock roll support assembly 400 and the stock supply assembly 402 to the side walls 37 of the machine's frame 36.

The coupling components 436 are arranged in the same symmetrical pattern as the coupling components 408 on the stock roll support assembly 400 whereby the stock roll support assembly 400 may be arranged in at least two, and preferably three or four, positions relative to the machine's frame 36. (See Figures 9A-9D.) In the illustrated embodiment, the openings 436 are arranged at the four corners of a square having sides positioned 45° relative to the edges of the stock supply assembly 400. In this manner, the stock roll support assembly 400 will be extend at an approximately 45° relative to the stock supply assembly 402. Again, other symmetrical arrangements, such as circular, triangular, and other polygonal arrangements, and also other positionings of the stock roll support assembly 400 relative to the stock supply assembly 402, are possible with, and contemplated by, the present invention.

The upstream end 432 includes two coupling components 440, specifically counterbore openings, adjacent its rounded corners, and three coupling components 442, also counterbore openings, arranged in a row inwardly from the corners. One of the openings 440 is used to mount the constant-entry bar 80 onto the stock supply assembly 402. The three coupling components 442 are used to mount the sheet separator 74, or more specifically, the three cylindrical separating bars 76, 77 and 78. As was explained above, the constant entry bar

80 provides a nonvarying point of entry for the stock material 22 into the separator 74 and forming assembly 52, regardless of the diameter of the stock roll 21. Thus, when a different diameter roll is used and/or as dispensation of the stock material 22 from roll 21 decreases its diameter, the point of entry of the stock material 22 into the separator 74 remains constant.

As was indicated above, only one of the bracket's openings 440 is used to mount the constant-entry bar 80 onto the stock supply assembly 402. By providing more than one opening on each of the brackets 428, it is possible to position the constant entry bar in more than one position relative to the stock roll 21 and/or the separator 74. For example, when the stock roll support assembly 400 extends outwardly from the frame base wall 43 (Figures 8A and 8C and Figures 9A and 9C), the non-adjacent openings 440 could be used to mount the constant-entry bar 80. (See Figure 12A.) When the stock roll support assembly 400 extends outwardly from the machine's cover 39 (Figures 1B and 1D and Figures 2B and 2D), the other openings 440 on the brackets 428 could be used to mount the constant entry bar 80. (See Figure 12B.)

Thus, the stock supply assembly 402 is designed so that the point of entry of the stock material 22 into the separator 74 may remain substantially the same regardless of the positioning of the stock roll support assembly 400. However, additionally or alternatively, the point of entry of the stock material 22 into the separator 74 could be changed depending on desired pad characteristics, machine operating particulars, paper quality/type, and other factors. In other words, this feature of the stock supply assembly 402 could be useful irrespective of whether a position-changing stock roll support assembly is being used.

One may now appreciate that the present invention provides a stock roll support assembly and/or a stock supply assembly which accommodate a variety of orientations of a cushioning conversion machine.

Referring now back to the packaging system 622, and particularly the components mounting the machine 20 to the machine mounting stand 620, as was explained above, the mounting components include the swivel plate 675 and the angle bracket 676 / fasteners 677 which mount the swivel plate 675 to the machine. These components are attached to the exterior of the machine 20 and extend outwardly therefrom. Accordingly, unless a machine is being mounted on a stand, they are generally not desirable to have on a "standless" machine which will rest on a surface or will otherwise be supported. From a manufacturing point of view, this makes it necessary to manufacture "stand" machines differently than "standless" machines.

As was also explained above, the packaging system 622 can be used to convert the machine 20 between a horizontal and vertical orientation. However, the angular adjustability of the machine is sometimes used to fine-tune the setting of the machine relative to a packaging site and/or a particular operator. The semi-circular array of openings 678 in the swivel plate allow only a set amount of positions within a 180° interval. Sometimes, the spacing of these openings 678 does not allow for the necessary or preferred fine-tuning of the machine. Also, although the swivel plate allows several settings within a 180° range, settings outside of this range (i.e. within a 360° range) are sometimes necessary or desirable.

The present invention provides mounting components which replace the mounting components of the packaging system described above and/or which may constitute the mounting components of any other packaging system which falls within the scope of the claims. As is explained in more detail below, the mounting components provide a high degree of fine-tuning ability and 90° pivot brake points. Additionally or alternatively, certain mounting components are located on the interior of the machine whereby they could, for the sake of manufacturing ease and consistency, be included in all manufactured cushioning conversation machines, without knowing whether a particular machine will be incorporated into a packaging system.

The mounting components comprise a pair of sliders 760, one of which is shown in Figure 13. The slider 760 includes a sleeve 774 which is similar in structure to the sleeve 664 in that it forms a square channel dimensioned to telescopically encase one of the vertical posts 632 so that it can slide relative to the post 632 during vertical adjustment of the machine 20. However, in contrast to the sleeve 664, the sleeve 774 only includes three sides defining the square channel. (See Figure 14.)

The slider 760 also includes a stop plate 770 which is attached to the sleeve 764. In contrast to the stop plate 670, the stop plate 770 is directly attached to the sleeve (such as by welding) whereby the side angle bracket 665 is eliminated. (See Figure 14.) Additionally, the stop plate 770 is circular in shape and includes two approximately 90° arcuate slots 771 oppositely positioned on peripheral portions of the circular plate extending beyond the lateral sides of the sleeve 764. (See Figure 13.)

The slider 760 additionally includes a pivot pin 781 which is attached to the sleeve 764 and extends outwardly through a central opening in the stop plate 770. (See Figures 13 and 14.) The pivot pin 781 is used to directly mount the machine 20 to the slider 760 whereby, in comparison to the mounting components of the packaging system 620, the need for the swivel plate 675 and/or the components attaching the swivel plate 675 to the machine 20 (angle bracket 676 and fasteners 677) is eliminated. As with the pivot pin 681 discussed above, the pivot pin 781 constitutes an axis about which the machine 20 may be selectively pivoted relative to the machine mounting stand 622 and is positioned so that the machine 20 is substantially weight balanced.

The pivot pin 781 extends through the side wall 37 of the machine 20 and preferably also through a rein-

forcement plate 37*a*, an overlay plate 782 and a bearing sleeve 783. (See Figure 14.) The reinforcement plate 37*a* is attached to the interior surface of the outer side wall casing (and may be viewed as part of the side wall 37) and the overlay plate 782 is directly attached (such as by welding) to the interior surface of the reinforcement plate 37*a*. (See Figure 15.) The overlay plate 782 includes a central opening 784 for accommodating the pivot pin 681. The bearing sleeve 783 is press-fit into the opening 784 and also into aligned openings in the side wall casing 37 and reinforcement plate 37*a*. A spigot (not shown) may be inserted through an appropriate opening in the distal end of the pivot pin 781 to provide a rotatably captive connection between the slider 760 and the machine 20.

The overlay plate 782 additionally includes four threaded openings 786a, 786b, 786c, and 786d which are positioned to coincide with the ends of the arcuate grooves 771 in the stop disk 770 when the machine 20 is in a horizontal or vertical condition. (See Figure 15.) The machine's side wall casing 37 and reinforcement Plate 37a include similar openings. (These are shown but not specifically numbered in Figure 14.) When setting the machine 20 at a desired angular orientation, a pair of locking elements 788 extend through the slots 771 of the stop plate 770, the openings in the side wall 37, and two of the four opening 786. The illustrated locking elements 788 are locking screws 788. (See Figure 14.) However, other locking elements, such as wing nuts or quick release bolts, are possible with, and contemplated by, the present invention. It may be noted that because the overlay plate 782 and the bearing 783 are located on the interior of the machine, they would not cause any interference if included (for the sake of manufacturing ease and consistency) on "stand-less" machines which will rest on a surface or will otherwise be supported.

The positioning of the locking elements relative to the stop plate slots 771 and the overlay plate openings 786 determines the angular orientation of the machine 20 relative to the machine stand 622. This positioning is best described by referring to Figures 16A-16P wherein the downstream direction of the machine 20 is schematically shown by an arrow. In Figure 16A, the machine 20 is positioned in a horizontal orientation. The openings 786a and 786b are situated in the upper ends of the slots of the stop plate 770 and the openings 786a and 786b are situated in the lower ends of the slots. The locking screws 788 are inserted through, and locked within, the opening 786a and the opening 786c. (For the purposes of clarity, the locking screws 788 are not numbered in the drawings, but are rather shown by darkening the corresponding opening in which they are inserted.)

To position the machine 20 to the inclined orientation shown in Figure 16B, whereat the machine 20 is sloped in the downstream direction at approximately 45°, the locking screws 788 are loosened (but not removed) and the machine 20 is pivoted in the counterclockwise direction. The pivoting of the machine 20 causes the locking screws 788 to move in a counterclockwise direction in the slots of the stop plate 770 and rearranges the openings 786 relative to the stop plate 770. When the machine reaches the desired inclined orientation, the locking screws 788 are tightened to lock the machine 20 at the desired orientation. At this orientation, the openings 786a and 786c (and the screw body) are positioned centrally within the stop plate slots and the openings 786b and 786d are hidden behind non-slotted portions of the stop plate 770 and/or the sleeve 774.

A similar procedure would be followed to position the machine in the more inclined orientation shown in Figure 16C and the vertical orientation shown in Figure 16D. It may be noted that because the stop plate 770 includes slots, rather than the array of openings 678 of the swivel plate 675 discussed above, more positional settings are possible. It may also be noted that although the loosening of the locking screws 788 allows the machine 20 to pivot relative to the machine mounting stand 622, the stop plate 770 limits pivoting within a 90° range. In comparison, no such limiting or braking function is present when the spring plunger 679 is retracted from the swivel plate 675.

In Figure 16D, the machine 20 is positioned in a vertical position whereat the machine's downstream end is at the top of the machine. The openings 786b and 786c are situated in the upper ends of the slots of the stop plate 770 and the openings 786a and 786d are situated in the lower ends of the slots. To position the machine 20 to the orientations shown in Figure 16F-16H, the locking screws 788 are loosened and removed from the openings 786a and 786c. The locking screws 788 are then inserted into the openings 786b and 786d. (See Figure 16E). The machine 20 may be pivoted in the counterclockwise direction to the inclined orientations shown in Figure 16F and 16G and the horizontal orientation shown in Figure 16H.

To position the machine 20 in the orientation shown in Figures 16J-16L, the locking screws 788 are removed from the opening 786b and 786d and inserted into the openings 786c and 786a (see Figure 16J) whereby the machine may be pivoted in the counterclockwise direction to the inclined orientations shown in Figure 16J and 16K and the vertical orientation shown in Figure 16L.

To position the machine in the orientations shown in Figures 16N-16P, the locking screws are removed from the openings 786c and 786a and inserted into the openings 786d and 786b. (See Figure 16M) whereby the machine may be pivoted in the counterclockwise direction to the inclined orientations shown in Figures 16N and 160 and the horizontal orientation shown in Figure 16P. Figure 16P is the same orientation as shown in Figure 16A, whereby the machine will have been pivoted 360° relative to the machine mounting frame.

One may now appreciate that the present invention provides mounting components for a packaging system

which provide a high degree of fine-tuning ability, include 90° pivot brake points, and could, for sake of manufacturing ease and consistency, be included on all cushioning conversion machines, regardless of whether they will be incorporated into a packaging system.

Although the invention has been shown and described with respect to certain preferred embodiments, it is obvious that equivalent and obvious alterations and modifications will occur to others skilled in the art upon the reading and understanding of this specification. The present invention includes all such alterations and modifications.

Claims

1. A cushioning conversion machine (20) comprising:

   a frame (36);
   conversion assemblies (52, 54), mounted to the frame (36), which convert a sheet-like stock material (22) into a three-dimensional cushioning product (32); and
   a stock roll support assembly (400), also mounted to the frame (36), which supports a stock roll (21) for dispensing the sheet-like stock material (22) to the conversion assemblies (52, 54);
   wherein the stock roll support assembly (400) may be positioned in a plurality of positions relative to the machine's frame (36).

2. A cushioning conversion machine (20) according to Claim 1 wherein the stock roll support assembly (400) may be positioned at four positions relative to the machine's frame (36).

3. A cushioning conversion machine (20) as set forth in Claim 1 or Claim 2 wherein the stock roll support assembly (400) defines a stock roll cradle (417) in which a stock roll rod (72) passing through the core of the stock roll (21) is inserted.

4. A cushioning conversion machine (20) according to Claim 3 wherein the machine's frame (36) includes a base wall (43) and a cover wall (39), and wherein the plurality of positions in which the stock roll support assembly (400) may be positioned includes:

   a position whereat the stock roll support assembly (400) extends outwardly from the machine's base wall (43) and the stock roll cradle (417) opens towards the downstream direction;
   a position whereat the stock roll support assembly (400) extends outwardly from the machine's cover wall (39) and the stock roll cradle (417) opens towards the downstream direction;
   a position whereat the stock roll support assembly (400) extends outwardly from the machine's base wall (43) and the stock roll cradle (417) opens towards the upstream direction; and/or
   a position whereat the stock roll support assembly (400) extends outwardly from the machine's cover wall (39) and the stock roll cradle (417) opens towards the upstream direction.

5. A cushioning conversion machine (20) as set forth in Claim 3 or Claim 4, wherein the stock roll cradle (417) is a U-shape slot portion (416) having a curved bottom surface and two sides extending therefrom which extend at an approximately 45° angle relative to the upstream-downstream direction (42) of the machine (20).

6. A cushioning conversion machine (20) comprising:

   a frame (36);
   conversion assemblies (52, 54), mounted to the frame (36), which convert a sheet-like stock material (22) into a three-dimensional cushioning product (32); and
   a stock roll support assembly (400), also mounted to the frame (36), which supports a stock roll (21) for dispensing the sheet-like stock material (22) to the conversion assemblies (52, 54);
   wherein the stock roll support assembly (400) includes a U-shape cradle (417) for the stock roll rod (72), the cradle (417) having a curved bottom surface and two sides extending therefrom which extend at an approximately 45° angle relative to the upstream-downstream direction (42) of the machine (20).

7. A cushioning conversion machine (20) according to Claim 6

   wherein the U-shape cradle (417) is part of a slot (410), the slot (410) also including a sloped inlet passage (415) into the U-shape cradle (417).

8. A cushioning conversion machine (20) according to Claim 7

   wherein the inlet passage (415) is defined by parallel sloped edge portions (412, 414) the cradle (417) is defined by a semi-circular edge portion (416), and the slot (410) is further defined by straight edge portions (418, 420) forming a transition between the inlet passage (415) and the cradle (417) and wherein the distance between the sloped edge portions (412, 414) is greater than the distance between the straight edge portions (418, 420) to facilitate loading of the stock roll (21) into the stock roll support assembly (400).

9. A cushioning conversion machine (20) as set forth in any preceding claim further comprising a stock

supply assembly (402) positioned upstream of the conversion assemblies (52, 54) and downstream of the stock roll support assembly (400), the stock supply assembly (402) including a bracket (428) and a roller (80) over which the stock material (22) passes to determine the entry path of the stock material (22) to the conversion assemblies (52, 54), the roller (80) being mountable in alternate positions on the bracket (428).

10. A cushioning conversion machine (20) comprising:

a frame (36);
conversion assemblies (52, 54), mounted to the frame (36), which convert a sheet-like stock material (22) into a three-dimensional cushioning product (32); and
a stock supply assembly, positioned upstream of the conversion assemblies (52, 54), which supplies the sheet-like stock material (22) to the conversion assembly;
wherein the stock supply assembly (402) includes a bracket (428) and a roller (80) over which the stock material (22) passes to determine the entry path of the stock material to the conversion assemblies (52, 54), the roller (80) being mountable in alternate positions on the bracket (428).

11. A packaging system (620) comprising a cushioning conversion machine (20) as set forth in any of the preceding claims, a machine mounting stand (622), and mounting components, the mounting components mounting the machine (20) to the machine mounting stand (622) in such a manner that the machine (20) may be pivoted relative to the machine mounting stand (622).

12. A packaging system (620) comprising a cushioning conversion machine (20), a machine mounting stand (622), and mounting components;

the cushioning conversion machine (20) including a housing (36) and conversion assemblies (52, 54) mounted to the housing (36) which convert a stock material (22) into a cushioning product (32);
the housing (36) defining an interior cavity in which at least some of the conversion assemblies (52, 54) are contained;
the mounting components mounting the machine (20) to the machine mounting stand (622) in such a manner that the machine's housing (36) and conversion assemblies (52, 54) may be pivoted relative to the machine mounting stand (622);
at least some of the mounting components being situated within the interior cavity defined by the machine's housing (36).

13. A packaging system as set forth in the preceding claim wherein the mounting components include a pivot pin (781) which extends through an opening in the machine's housing into the interior cavity, the pivot pin constituting an axis about which the machine (20) may be selectively pivoted relative to the machine mounting stand.

14. A packaging system comprising a cushioning conversion machine (20), a machine mounting stand (622), and mounting components;

the cushioning conversion machine (20) including a housing and conversion assemblies (52, 54) mounted to the housing which convert a stock material (22) into a cushioning product (32);
the mounting components mounting the machine (20) to the machine mounting stand (622) in such a manner that the machine's housing and conversion assemblies (52, 54) may be pivoted relative to the machine mounting stand;
wherein
the mounting components allow the machine (20) to be pivoted substantially 360° relative to the machine mounting stand about a substantially horizontal axis.

15. A packaging system (620) as set forth in any of claims 11-14 wherein the mounting components include a stop plate (770) having slots (771) thereon which define the pivot path of the machine (20) relative to the machine mounting stand (622) and locking elements (788) which extend through the slots (771) in the stop plate (770) to lock the machine (20) in a chosen pivotal position relative to the machine mounting stand (622).

16. A packaging system (620) as set forth in the previous claim wherein the slots (771) and the locking elements (788) perform a braking function when the machine (20) is being pivoted relative to the machine mounting stand.

17. A cushioning conversion machine comprising a stock roll support assembly and/or a constant entry bar which may be positioned in a plurality of orientations.

18. A cushioning conversion machine comprising a stock roll support assembly including a U-shape cradle (417) for the stock roll rod (72), the cradle (417) having a curved bottom surface and two sides extending therefrom which extend at an approximately 45° angle relative to the upstream-downstream direction of the machine.

19. A packaging system in which a cushioning conversion machine may be pivoted substantially 360° relative to a machine mounting.

20. A packaging system comprising a cushioning conversion machine rotatably mounted to a machine mounting stand, at least some of the mounting components being situated within the interior of the housing of the cushioning conversion machine.

21. A packaging system comprising a cushioning conversion machine mounted to a machine mounting stand, at least some of the mounting components performing as a braking function when them machine is pivoted relative to the stand.

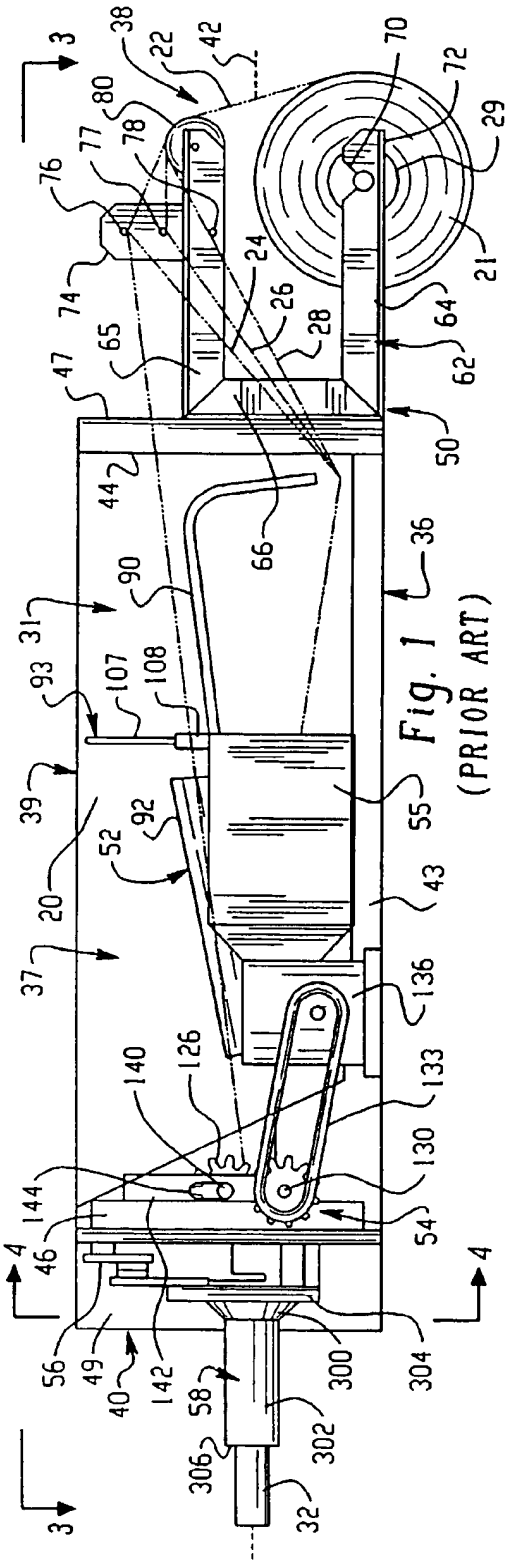

Fig. 1
(PRIOR ART)

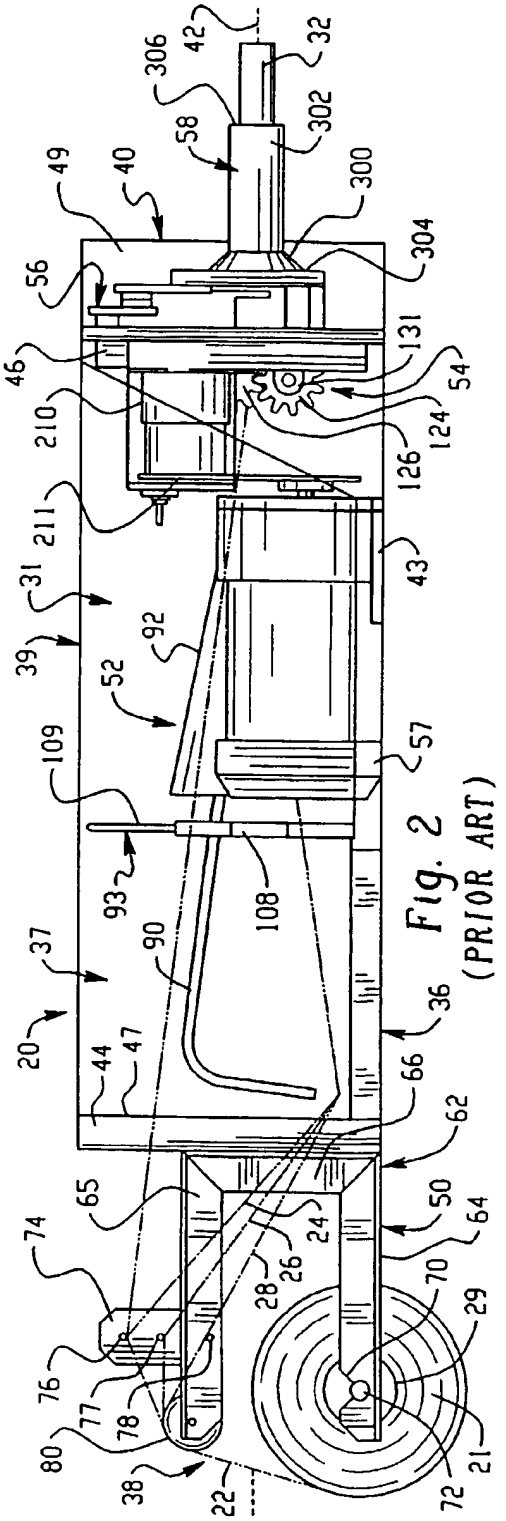

Fig. 2
(PRIOR ART)

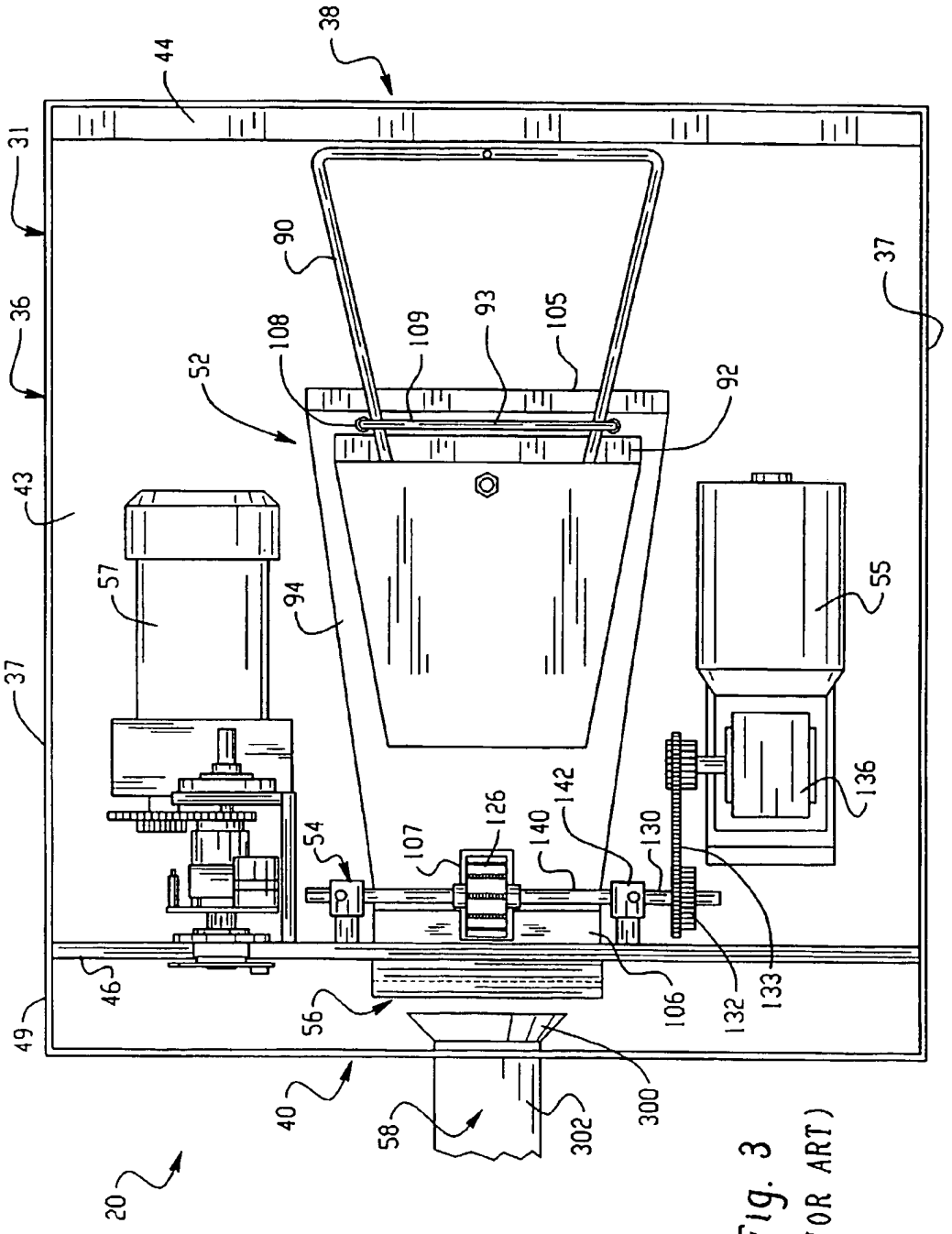

Fig. 3
(PRIOR ART)

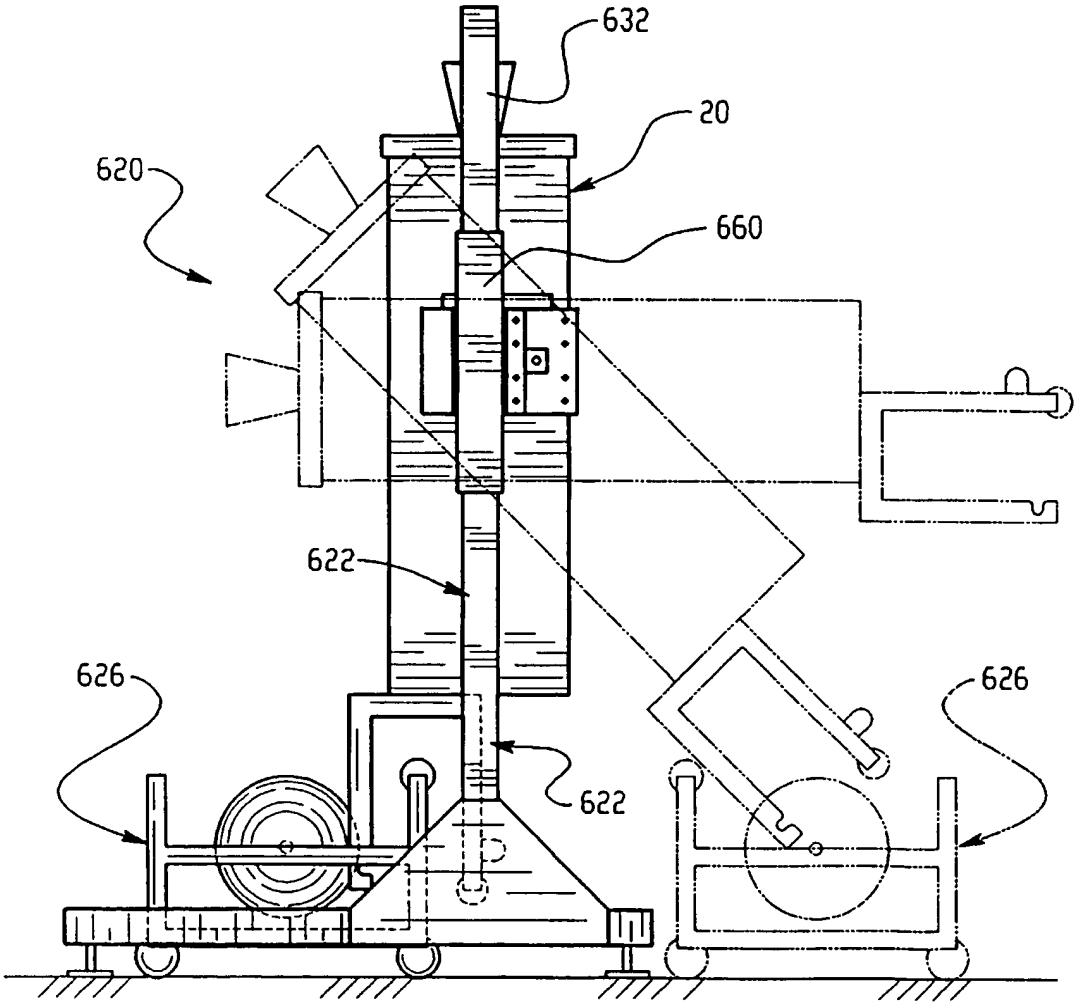

Fig. 4
(PRIOR ART)

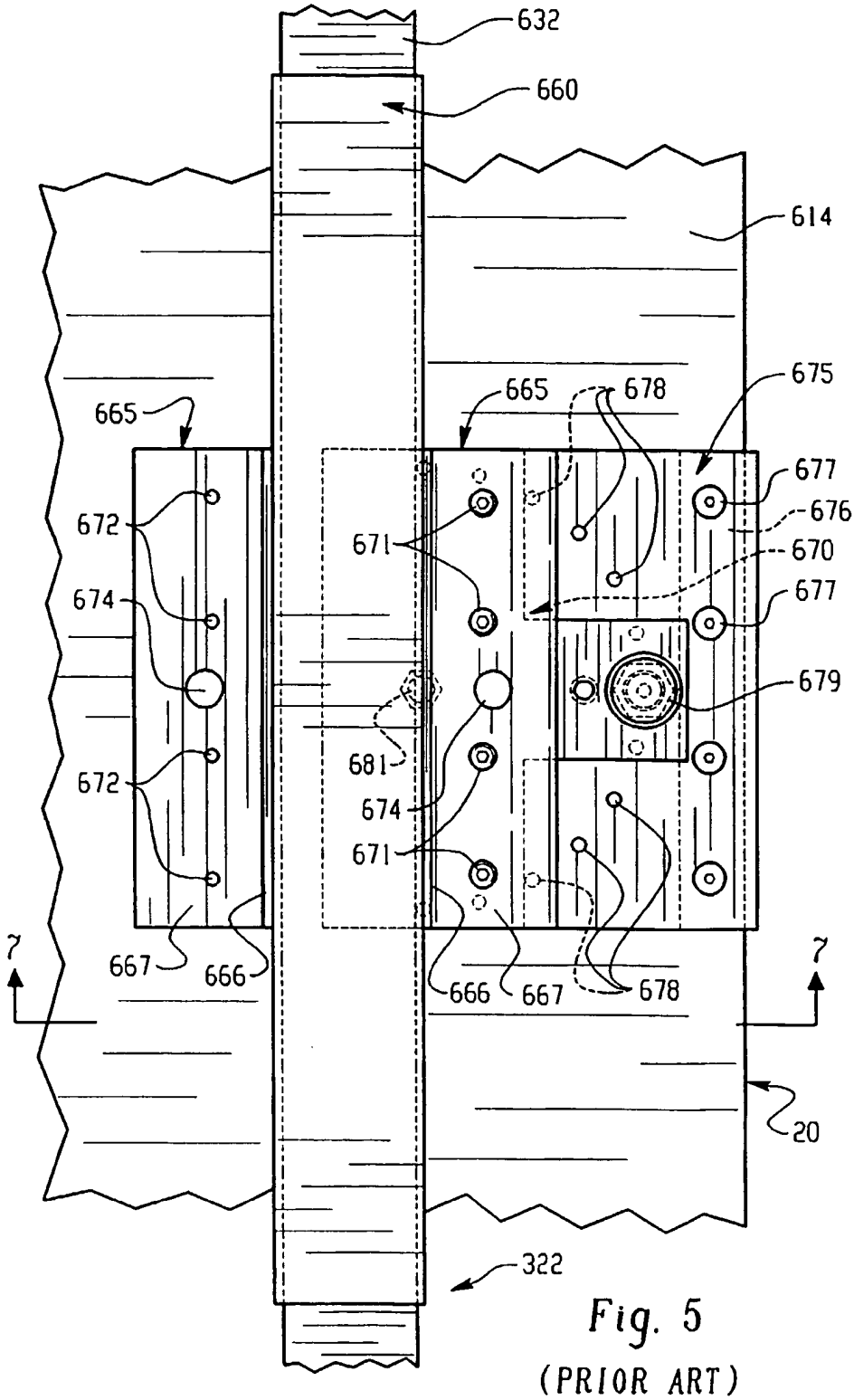

Fig. 5
(PRIOR ART)

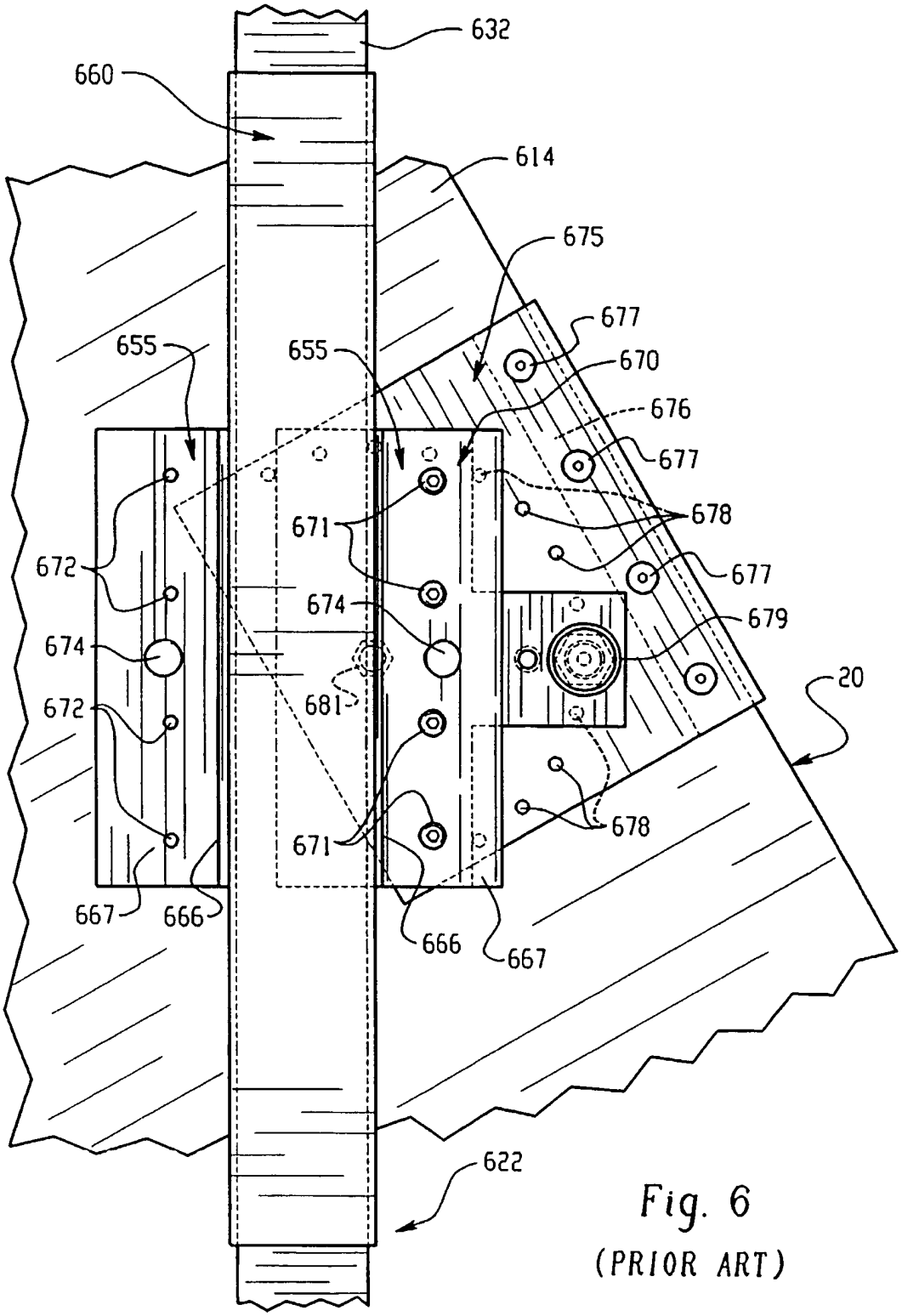

Fig. 6
(PRIOR ART)

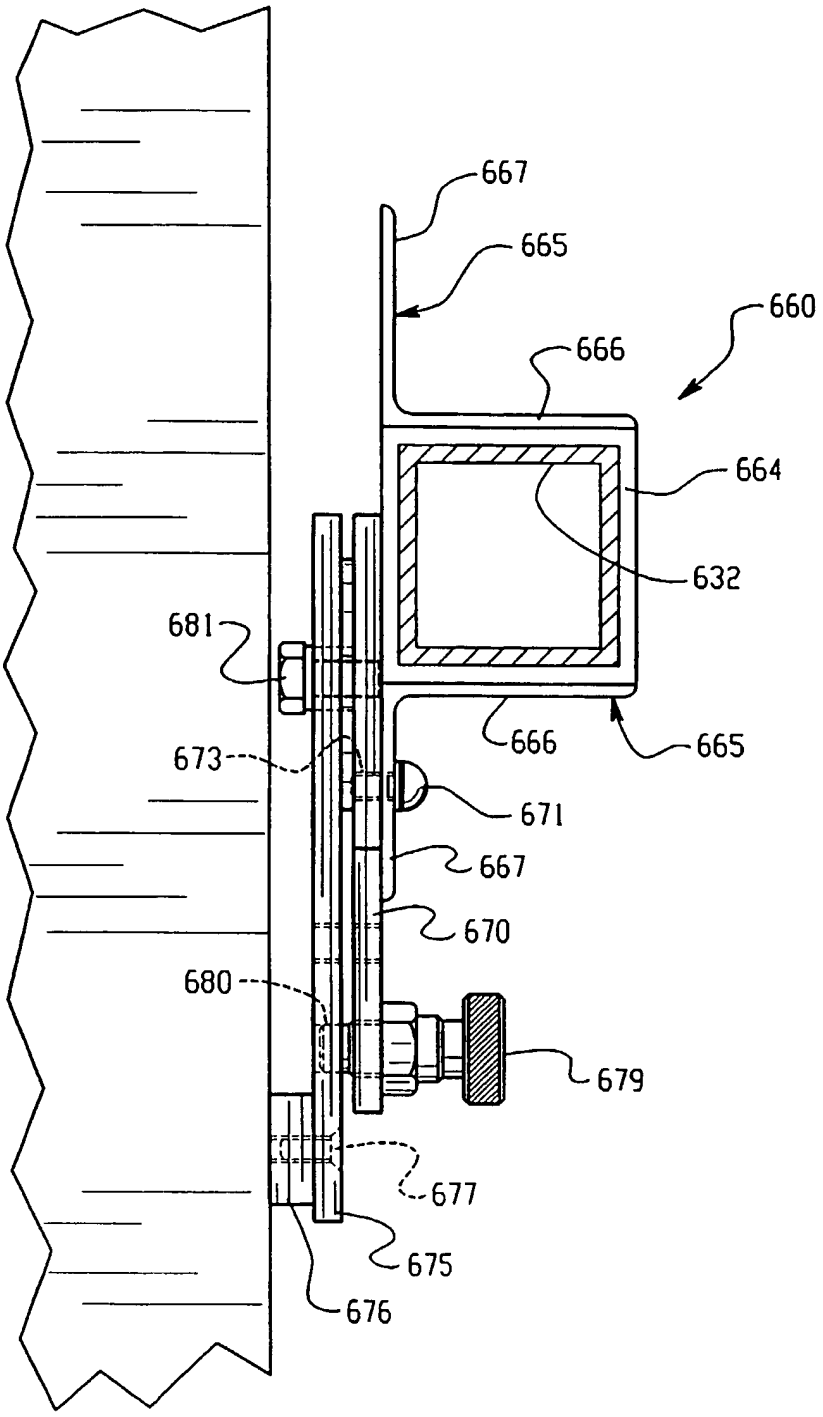

Fig. 7
(PRIOR ART)

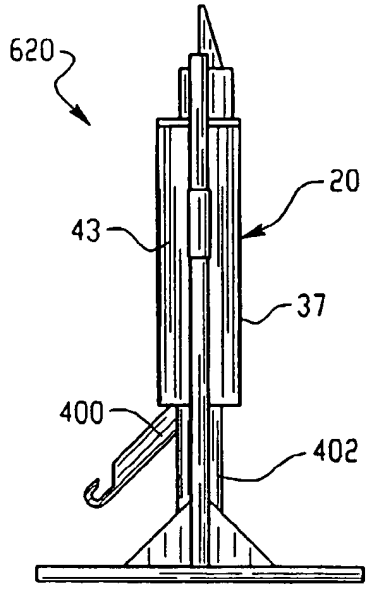

Fig. 8A

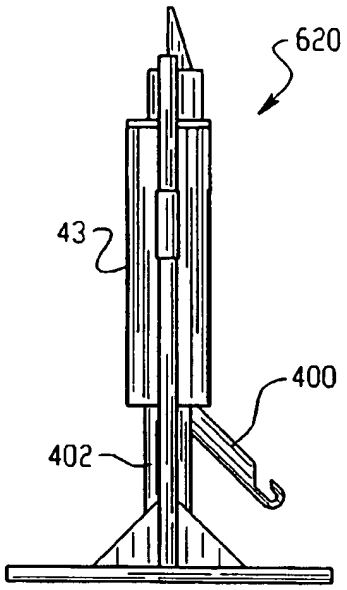

Fig. 8B

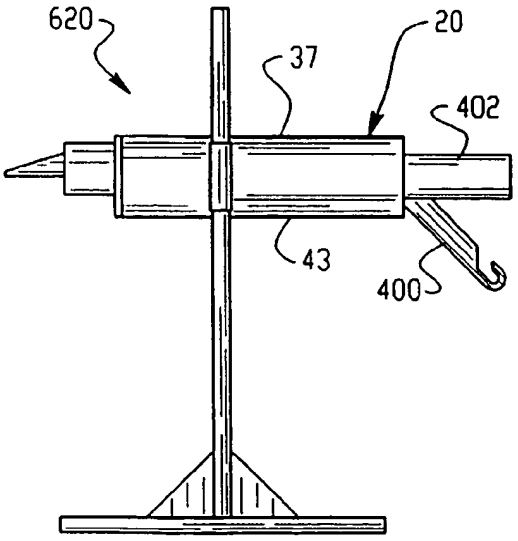

Fig. 8C

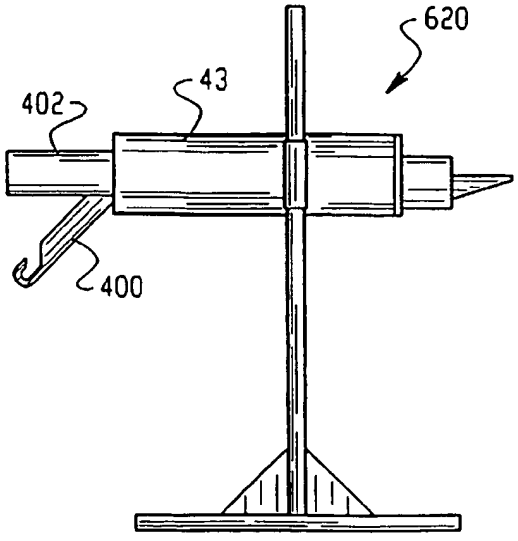

Fig. 8D

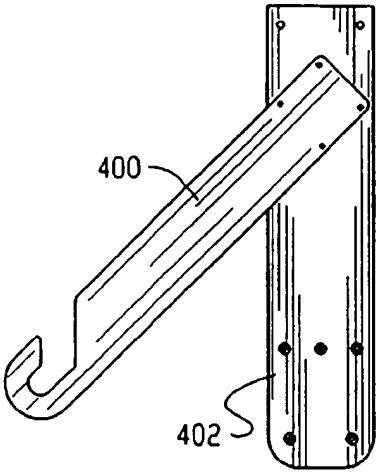

Fig. 9A

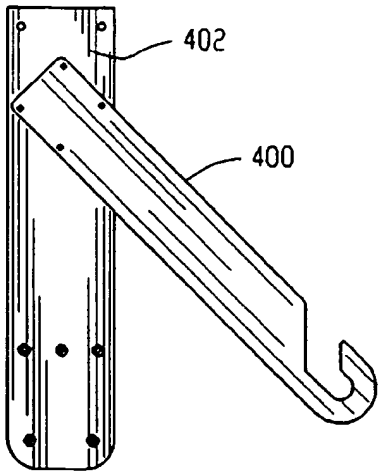

Fig. 9B

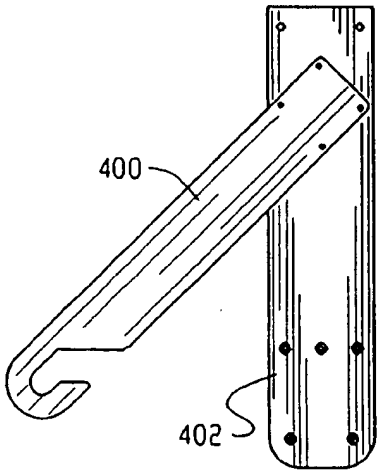

Fig. 9C

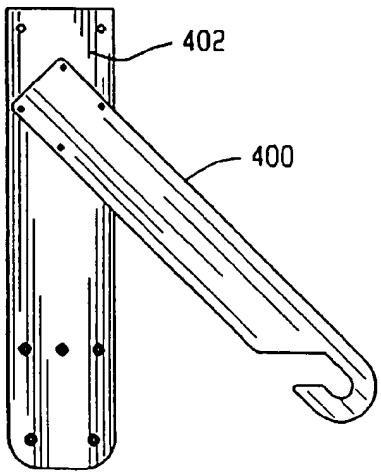

Fig. 9D

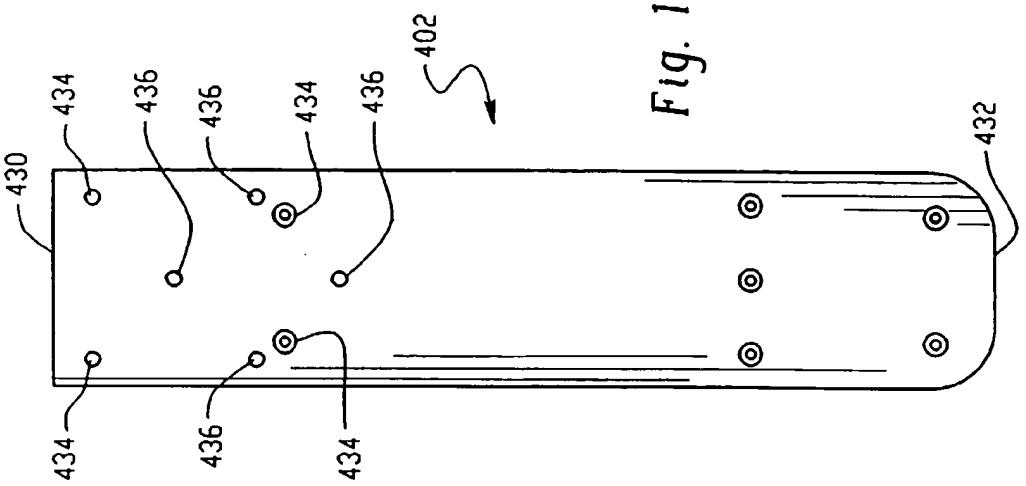
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Fig. 11

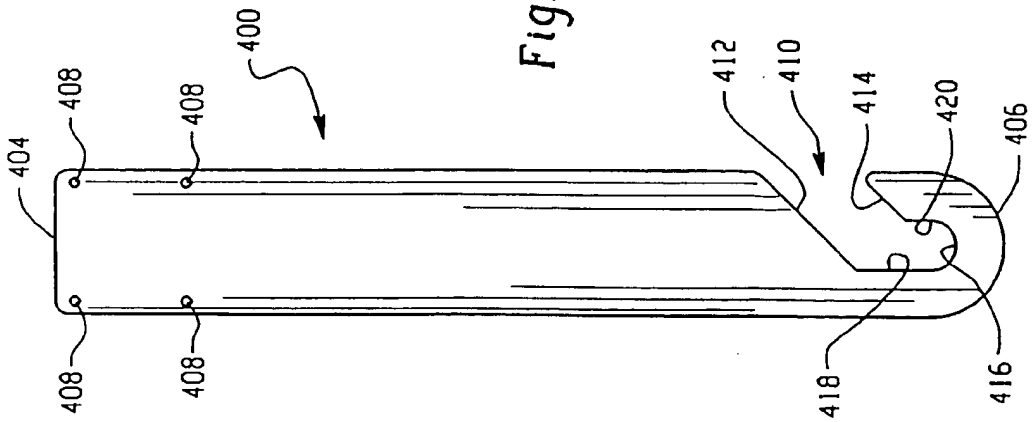
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Fig. 10

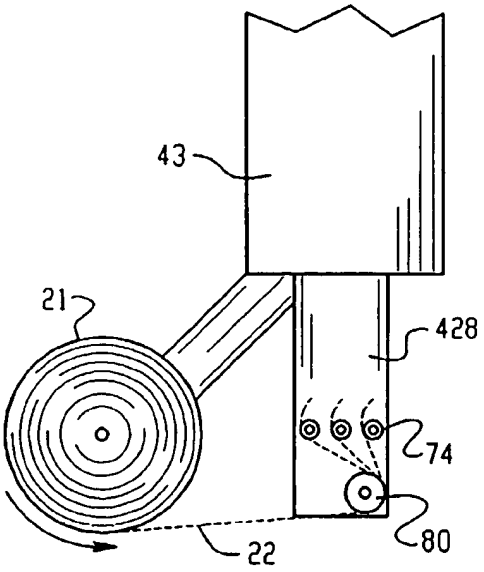


Fig. 12A

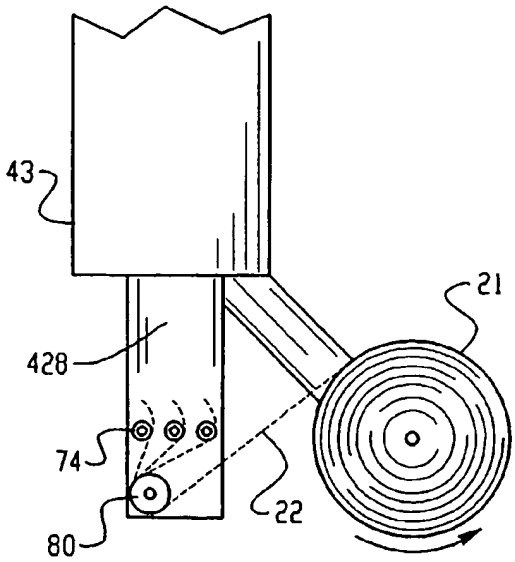


Fig. 12B

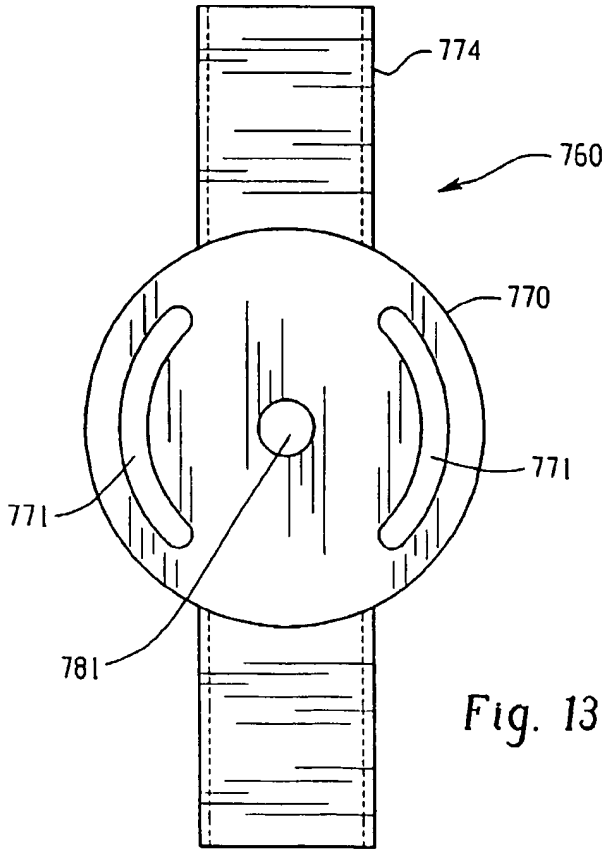
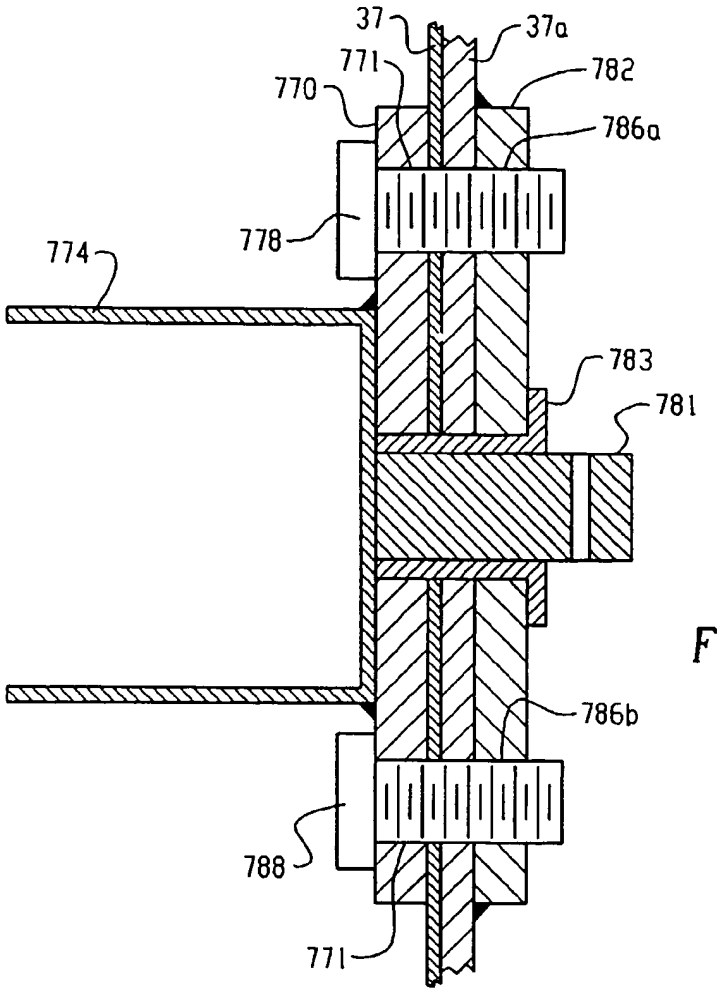


Fig. 13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786b
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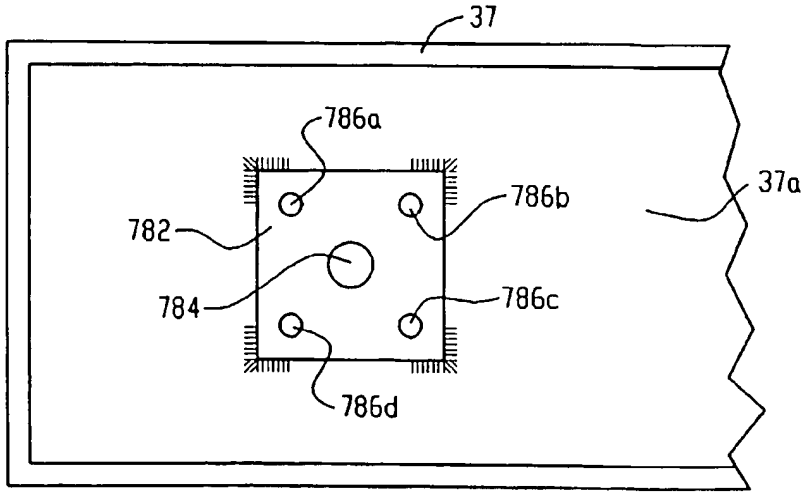
Fig. 14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786c
786d

Fig. 15

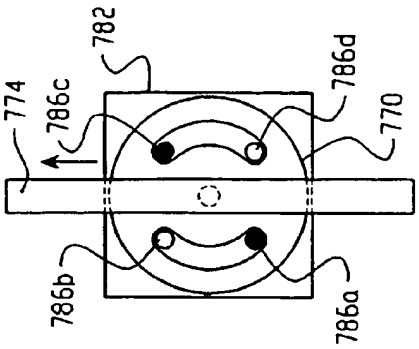

Fig. 16D

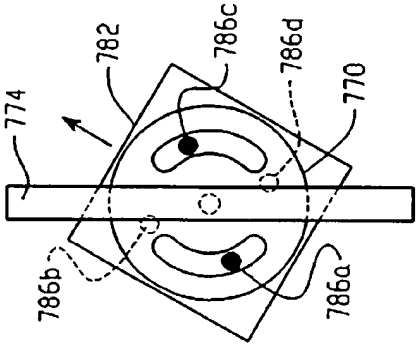

Fig. 16C

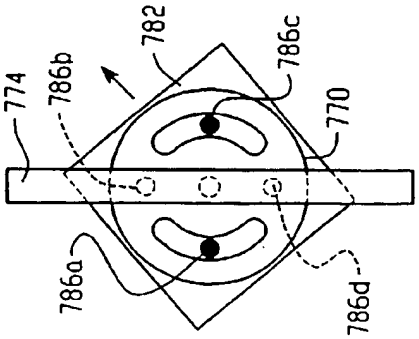

Fig. 16B

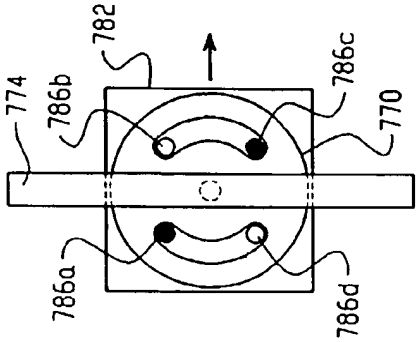

Fig. 16A

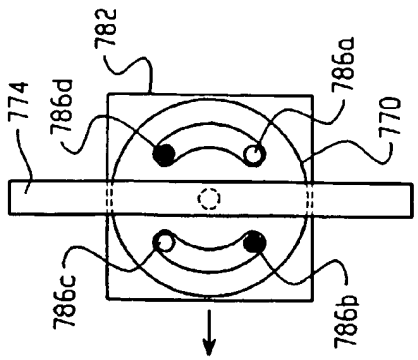

Fig. 16H

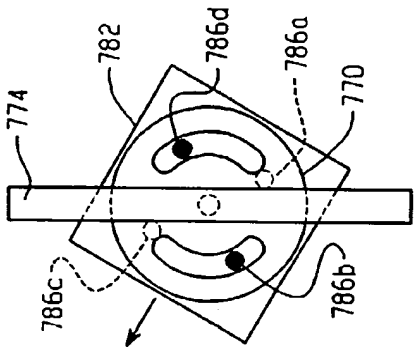

Fig. 16G

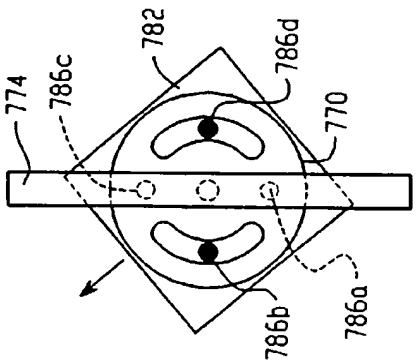

Fig. 16F

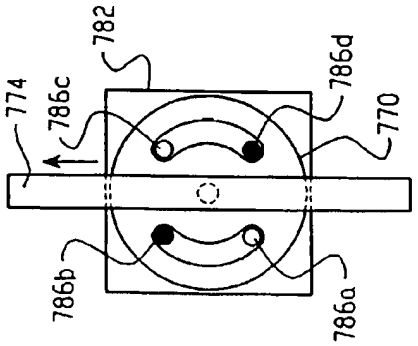

Fig. 16E

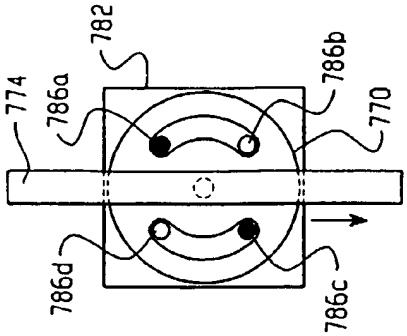

Fig. 16L

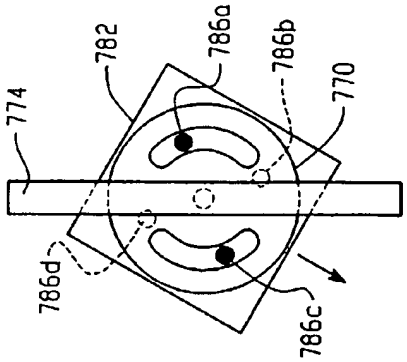

Fig. 16K

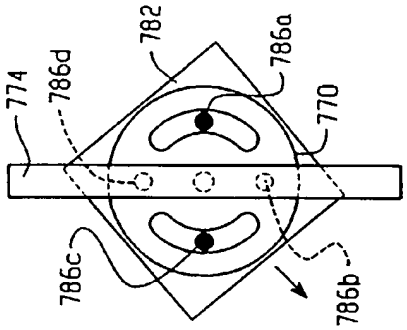

Fig. 16J

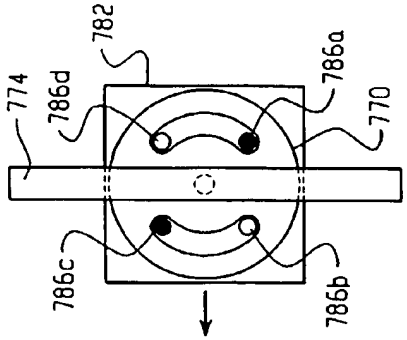

Fig. 16I

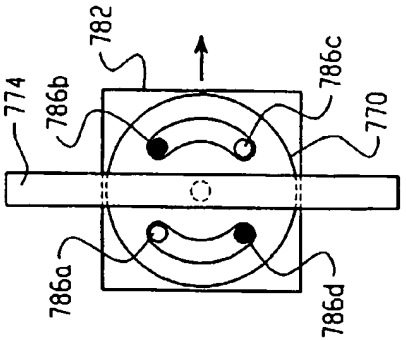

Fig. 16P

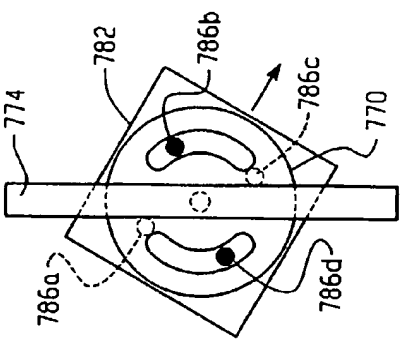

Fig. 16O

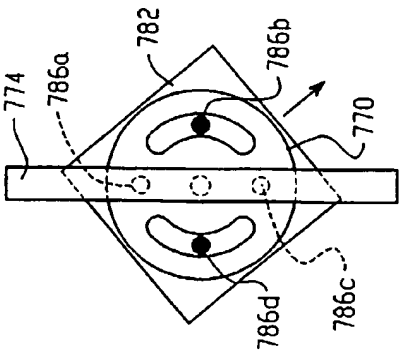

Fig. 16N

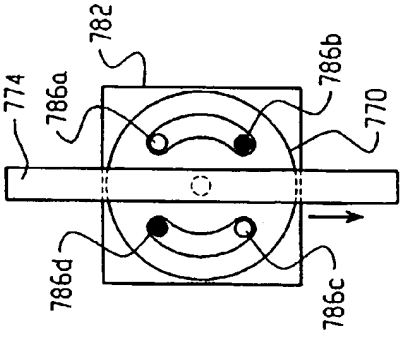

Fig. 16M